

MISCELLANEOUS.

On the Histology of the Alimentary Canal in the Larva of Chironomus plumosus. By P. VIGNON.

I. *Criticism on the Vesicular Theory of the Secretion of Glandular Merocrine Cells.*—I thus characterize the theory held with regard to renal cells by a long list of authors, from Muron in 1871 down to Simon in 1898 (also by Cornil in 1879 and 1884, Altmann, Nicolas, Van der Stricht, Disse, &c.), and criticized by Hortolés in 1881 and by Sauer in 1895. This theory was applied by Van Gehuchten in 1890 to the intestine of a dipterous larva, *Ptychoptera*; then in 1893 to the intestine of the larvæ of the fly, of *Ascaris*, and of *Arenicola*, &c. It is accepted by most authorities, and I know of no criticism of it so far as it relates to intestinal cells*.

The tissues of the larva of *Chironomus* being quite transparent, observations made upon the fry, and even on the complete animal when very young, point to the following conclusions:—the hyaline vesicles which support the brush-like edge (or striated platform—"plateau") seen on the greater part of the cells of the mid-gut, and which afterwards show it up and spread into the cæca or the chylic stomach, as well as into the Malpighian tubules, without anywhere being dissolved, are the result of a pathological state or of some very light pressure, or, again, of the action of a fluid said to be *indifferent*, and with more likelihood of fixative solutions.

Not a single one is ever seen in the living and uninjured animal even when digestion is in full swing. One has no right to draw conclusions from these plasmolytic changes as to the secretory properties of the epithelial cell; they are simply a proof of the great ease with which it may undergo alteration.

I shall endeavour to ascertain eventually whether these conclusions apply to all the glandular merocrine cells.

II. *Formation of the Peritrophic Membrane.*—This chitinous membrane, imperforate but at the same time extremely permeable, has no connexion with the walls of the chylic stomach, at least in the present case. This is in direct opposition to the somewhat indecisive opinion of Plateau in 1876, of Balbiani in 1890, and to the plainer statement of Voinov in 1898. The last observer believes it to be formed of all the cell-plates supported by the secretive vesicles. Although it may be firmly fixed to the external wall of the œsophageal tube, as has been observed by A. Schneider in 1887, followed by Balbiani in 1890 (in both cases in the larva of *Chironomus*), it is not formed in that position. It arises in a fluid state

* I may refer to the statement which I made in vol. iii. of the 'Année biologique' in the course of a review entitled "Les Canalicules urinaires des Vertébrés."

from the first large cells with brush-like edge belonging to the mid-gut right at the top of the proventricular chamber. This agrees with Cuénot's opinion in 1895 with regard to several Orthoptera. Furthermore, while spreading over the cuticle of the external wall of the tube, in intimate connexion with the latter, it passes into a very elegant lamina, which has not been described. It is also through the annular space enclosed between the tube, whose wall is thickened to form a solid ring, and a second chitinous external ring secreted by the wall of the mid-gut that the secretion-products of the proventricular cæca flow (well figured diagrammatically by A. Schneider). The arrangement is complicated by a little truncatedly conical ring arising from the wall of the tube, and which separates the internal chitinous ring from the external plastic chitin of the membrane. The whole structure is shown up in sections by the differences of power of taking the stain displayed by the cuticle of the tube and rings and that of the still plastic peritrophic chitin. Below this passage the membrane becomes consistent and very thin. It is continually induced to go forward by the pressure of the food driven out of the œsophagus by the action of the circular muscles.

III. *Existence of Vibratile Cilia in the Mid- and Hind-Gut of the Larva of Chironomus.*—It is necessary to examine a number of animals in order to find and fix these in a perfect state. Examination would be impossible in the absence of transparent tissues. The cilia are found at the opening of the proventricular cæca in the three regions into which the chylific stomach is divided—in the first two on the brush-like edge, in the third (where the Malpighian tubules open) on the cellular wall, devoid of platform (plateau). It is very interesting to determine that the platform is never wanting in the first two regions, when one cannot see the cilia, but when these exist they may be planted directly on the cell. This simplification, here accidental, is comparable with the observations of Engelmann in 1880 and of Frenzel in 1886, who look upon the component parts of the brush as an immobile proximal segment forming an integral portion of the whole and completely differentiated ciliary apparatus. As there exists in the animal kingdom an infinity of non-ciliated cells with a platform, the larva of *Chironomus* takes an intermediate position in which the platform is probably only ciliated in a certain number of individual cases.

Cilia also are present in the hind-gut on the chitin, which is very thin. They are only found sparingly at the beginning, and particularly so in the widened part, where it joins the mid-gut.

I shall give more details of the anatomy and histology of the alimentary canal in this larva in a note which I shall publish shortly in the 'Archives de Zoologie expérimentale.'—*Comptes Rendus*, t. cxxviii. (1899) pp. 1596-1598.